BETHLEHEM

33-INCH AND 36-INCH BEAMS AND GIRDERS

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

BETHLEHEM

33-INCH AND 36-INCH BEAMS AND GIRDERS

Catalogue S-29
March, 1928

Supplement to Catalogue S-27 entitled
BETHLEHEM STRUCTURAL SHAPES
dated January, 1928.

BETHLEHEM STEEL COMPANY.
General Offices: BETHLEHEM, PA.

INTRODUCTION.

This catalogue presents information relating to Bethlehem 33-inch and 36-inch I Beams and Girders, comprising drawings of these sections together with dimensions, weights, properties, tables of safe loads when used as beams and when used as columns, and other useful data.

This is a supplement to the previous catalogue S-27 entitled "BETHLEHEM STRUCTURAL SHAPES" dated January 1928.

In computing the weights and properties of all sections the fillets have been included.

The slope of the flanges of all Bethlehem Girder Beams and I Beams is $8\frac{1}{3}$ per cent or 1 in 12.

The dimensions, areas and weights presented herein are theoretical and subject to the usual variations.

These sections are steel and their weights are calculated on the basis of 489.6 pounds per cubic foot; and 3.4 times the sectional area in square inches, equals the weight in pounds per linear foot.

All of the sections are numbered for convenience and identification in ordering.

These sections and their manufacture are protected by basic United States Letters Patent.

BETHLEHEM STEEL COMPANY.

Bethlehem, Pennsylvania.
March 15, 1928.

GENERAL CONDITIONS.

Allowable Variations. The shapes herein will be cut to ordered length with an allowable variation either way within ½ inch.

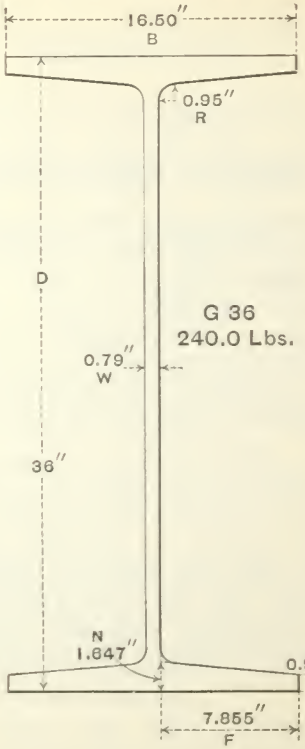
For cutting with less variation, or to exact length, an extra price is charged.

These shapes are billed and charged at catalogue weights and may have an allowable variation of 2½ per cent either way from the nominal section.

Material. All Bethlehem Structural Shapes are of open hearth steel exclusively, conforming to Manufacturers' Standard Specifications, to those of the American Society for Testing Materials and also to the American Railway Engineering and Maintenance of Way Association specifications.

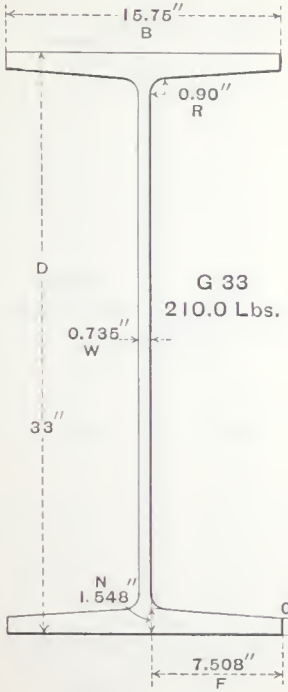
Material complying with any other standard specifications may be furnished by special arrangement.

BETHLEHEM GIRDER BEAMS.



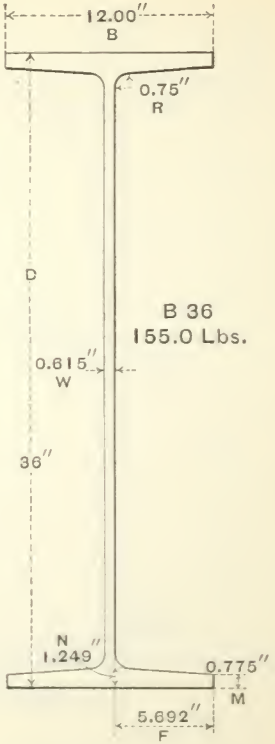
Section Number.	Weight per Foot, Pounds.	Nominal Depth of Beam, Inches	DIMENSIONS, IN INCHES.						
			Nominal D	B	W	M	N	F	R
G36	260.0	36¼	36.24	16.555	.845	1.113	1.767	7.855	.95
	250.0	36⅛	36.12	16.530	.820	1.053	1.707	7.855	.95
	240.0	**36**	**36.00**	**16.500**	**.790**	**.993**	**1.647**	**7.855**	**.95**
	231.0	35⅞	35.88	16.480	.770	.933	1.587	7.855	.95

BETHLEHEM GIRDER BEAMS.



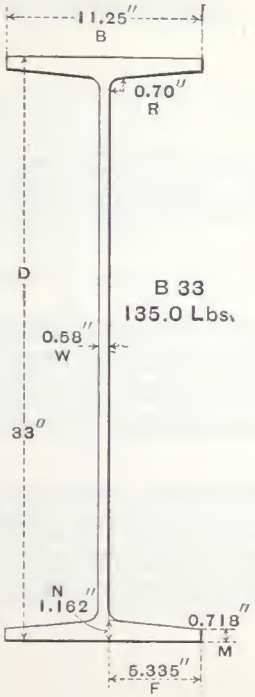
Section Number.	Weight per Foot, Pounds.	Nominal Depth of Beam, Inches.	DIMENSIONS, IN INCHES.						
			Nominal D	B	W	M	N	F	R
G33	230.0	33¼	33.25	15.810	.795	1.047	1.673	7.508	.90
	220.0	33⅛	33.12	15.780	.765	.982	1.608	7.508	.90
	210.0	**33**	**33.00**	**15.750**	**.735**	**.922**	**1.548**	**7.508**	**.90**
	202.0	32⅞	32.88	15.735	.720	.862	1.488	7.508	.90

BETHLEHEM I BEAMS.

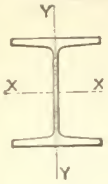


Section Number.	Weight per Foot, Pounds	Nominal Depth of Beam, Inches.	DIMENSIONS, IN INCHES.						
			Nominal D	B	W	M	N	F	R
B36	173.0	36¼	36.25	12.065	.680	.900	1.374	5.692	.75
	164.0	36⅛	36.12	12.030	.645	.835	1.309	5.692	.75
	155.0	**36**	**36.00**	**12.000**	**.615**	**.775**	**1.249**	**5.692**	**.75**
	147.0	35⅞	35.88	11.975	590	.715	1.189	5.692	.75

BETHLEHEM I BEAMS.



Section Number.	Weight per Foot, Pounds.	Nominal Depth of Beam, Inches.	DIMENSIONS, IN INCHES.						
			Nominal D	B	W	M	N	F	R
B33	152.0	33¼	33.25	11.320	.650	.843	1.287	5.335	.70
	143.0	33⅛	33.12	11.285	.615	.778	1.222	5.335	.70
	135.0	**33**	**33.00**	**11.250**	**.580**	**.718**	**1.162**	**5.335**	**.70**
	125.0	32⅞	32.88	11.210	.540	.658	1.102	5.335	.70



PROPERTIES OF
BETHLEHEM GIRDER BEAMS.

Section Number.	Nominal Depth of Beam, Inches.	Weight per Foot, Pounds.	Area of Section, Square Inches.	Thickness of Web, Inches.	Width of Flange, Inches.	AXIS X-X. Moment of Inertia, Inches^4. I	Radius of Gyration, Inches. r	Section Modulus, Inches^3. S
G36	36¼	260.0	76.50	.845	16.555	17,205	15.00	949.5
	36⅛	250.0	73.61	.820	16.530	16,457	14.95	911.2
	36	240.0	70.55	.790	16.500	15,696	14.92	872.0
	35⅞	231.0	67.85	.770	16.480	14,979	14.86	835.0
G33	33¼	230.0	67.85	.795	15.810	12,935	13.81	778.0
	33⅛	220.0	64.80	.765	15.780	12,278	13.77	741.4
	33	210.0	61.91	.735	15.750	11,671	13.73	707.3
	32⅞	202.0	59.53	.720	15.735	11,114	13.66	676.0

W = Safe Load, in pounds, uniformly distributed, including weight of beam.
L = Span, in feet.
M$_f$ = Bending Moment of forces, in foot pounds.
f = Allowable Fiber Stress, in pounds per square inch.
S = Section Modulus about axis X-X.

PROPERTIES OF
BETHLEHEM GIRDER BEAMS.

COEFFICIENTS OF STRENGTH.				AXIS Y-Y.			
For Fiber Stress of 18,000 Lbs. per Sq. In. For Quiescent Loads. C	For Fiber Stress of 16,000 Lbs. per Sq. In. For Quiescent Loads. C′	For Fiber Stress of 12,000 Lbs. per Sq. In. For Moving Loads. C″	Maximum Safe Shear on Web, in Pounds.	Moment of Inertia, Inches^4. I′	Radius of Gyration, Inches. r′	Section Modulus, Inches^3. S′	Section Number.
11,390,000	10,130,000	7,596,000	275,700	973.7	3.57	117.6	
10,930,000	9,720,000	7,290,000	261,300	923.8	3.54	111.8	G36
10,460,000	9,301,000	6,976,000	244,300	873.5	3.52	105.9	
10,020,000	8,906,000	6,680,000	232,900	825.3	3.49	100.2	
9,337,000	8,299,000	6,224,000	242,500	799.6	3.43	101.2	
8,897,000	7,909,000	5,932,000	226,600	752.2	3.41	95.3	G33
8,488,000	7,545,000	5,659,000	211,000	708.5	3.38	90.0	
8,112,000	7,211,000	5,408,000	202,900	667.3	3.35	84.8	

C, C′, and C″ = Coefficients given in the table.

$$W = \frac{C}{L}, \text{ or } \frac{C'}{L}, \text{ or } \frac{C''}{L}; \quad M_f = \frac{C}{8}, \text{ or } \frac{C'}{8}, \text{ or } \frac{C''}{8}$$

$$C, \text{ or } C', \text{ or } C'' = WL = 8M_f = \tfrac{2}{3} fS$$

PROPERTIES OF
BETHLEHEM I BEAMS.

Section Number.	Nominal Depth of Beam, Inches.	Weight per Foot, Pounds.	Area of Section, Square Inches.	Thickness of Web, Inches.	Width of Flange, Inches.	AXIS X-X. Moment of Inertia, Inches^4. I	Radius of Gyration, Inches. r	Section Modulus, Inches^3. S
B36	36¼	173.0	50.94	.680	12.065	10,784	14.55	595.0
	36⅛	164.0	48.10	.645	12.030	10,133	14.51	561.1
	36	155.0	45.58	.615	12.000	9,547.4	14.47	530.4
	35⅞	147.0	43.24	.590	11.975	8,986.2	14.42	500.9
B33	33¼	152.0	44.69	.650	11.320	7,953.4	13.34	478.4
	33⅛	143.0	42.05	.615	11.285	7,442.2	13.30	449.4
	33	135.0	39.55	.580	11.250	6,967.4	13.27	422.3
	32⅞	125.0	36.88	.540	11.210	6,482.7	13.26	394.3

W = Safe Load, in pounds, uniformly distributed, including weight of beam.
L = Span, in feet.
M$_f$ = Bending Moment of forces, in foot pounds.
f = Allowable Fiber Stress, in pounds per square inch.
S = Section Modulus about axis X-X.

PROPERTIES OF
BETHLEHEM I BEAMS.

COEFFICIENTS OF STRENGTH.				AXIS Y-Y.			
For Fiber Stress of 18,000 Lbs. per Sq. In. For Quiescent Loads. **C**	For Fiber Stress of 16,000 Lbs. per Sq. In. For Quiescent Loads. **C′**	For Fiber Stress of 12,000 Lbs. per Sq. In. For Moving Loads. **C″**	Maximum Safe Shear on Web, in Pounds.	Moment of Inertia, Inches^4. **I′**	Radius of Gyration, Inches. **r′**	Section Modulus, Inches^3. **S′**	Section Number.
7,140,000	6,347,000	4,760,000	183,900	301.1	2.43	49.9	
6,733,000	5,985,000	4,489,000	165,600	279.4	2.41	46.5	
6,365,000	5,658,000	4,243,000	150,300	259.9	2.39	43.3	B36
6,011,000	5,343,000	4,007,000	137,700	240.9	2.36	40.2	
5,741,000	5,103,000	3,827,000	167,500	233.0	2.28	41.2	
5,393,000	4,794,000	3,595,000	150,300	215.1	2.26	38.1	
5,067,000	4,504,000	3,378,000	133,700	198.7	2.24	35.3	B33
4,732,000	4,206,000	3,155,000	115,500	182.3	2.22	32.5	

C, **C′**, and **C″** = Coefficients given in the table.

$\mathbf{W} = \frac{\mathbf{C}}{\mathbf{L}}$, or $\frac{\mathbf{C'}}{\mathbf{L}}$, or $\frac{\mathbf{C''}}{\mathbf{L}}$; $\mathbf{M}_f = \frac{\mathbf{C}}{8}$, or $\frac{\mathbf{C'}}{8}$, or $\frac{\mathbf{C''}}{8}$

C, or **C′**, or **C″** $= \mathbf{WL} = 8\mathbf{M}_f = \frac{2}{3} f\mathbf{S}$

SAFE LOADS UNIFORMLY DISTRIBUTED FOR
BETHLEHEM GIRDER BEAMS,
IN THOUSANDS OF POUNDS.

Maximum Fiber Stress, 18,000 Pounds per Square Inch.

BEAMS SECURED AGAINST YIELDING SIDEWAYS.

Span in Feet.	G 36				G 33			
	36¼″	36⅛″	36″	35⅞″	33¼″	33⅛″	33″	32⅞″
	260 Lbs.	250 Lbs.	240 Lbs.	231 Lbs.	230 Lbs.	220 Lbs.	210 Lbs.	202 Lbs.
					485.0	453.2		405.8
20	551.5	522.6	.....	.....	466.9	444.9	422.0	405.6
21	542.4	520.5	488.7	465.8	444.6	423.7	404.2	386.3
22	517.7	496.8	475.5	455.5	424.4	404.4	385.8	368.7
23	495.2	475.2	454.8	435.7	406.0	386.8	369.0	352.7
24	474.6	455.4	435.8	417.5	389.0	370.7	353.7	338.0
25	455.6	437.2	418.4	400.8	373.5	355.9	339.5	324.5
26	438.1	420.4	402.3	385.4	359.1	342.2	326.5	312.0
27	421.9	404.8	387.4	371.1	345.8	329.5	314.4	300.4
28	406.8	390.4	373.6	357.9	333.5	317.8	303.1	289.7
29	392.8	376.9	360.7	345.5	322.0	306.8	292.7	279.7
30	379.7	364.3	348.7	334.0	311.2	296.6	282.9	270.4
31	367.4	352.6	337.4	323.2	301.2	287.0	273.8	261.7
32	355.9	341.6	326.9	313.1	291.8	278.0	265.3	253.5
33	345.2	331.2	317.0	303.6	282.9	269.6	257.2	245.8
34	335.0	321.5	307.6	294.7	274.6	261.7	249.6	238.6
35	325.4	312.3	298.9	286.3	266.8	254.2	242.5	231.8
36	316.4	303.6	290.6	278.3	259.4	247.1	235.8	225.3
37	307.8	295.4	282.7	270.8	252.4	240.5	229.4	219.2
38	299.7	287.6	275.3	263.7	245.7	234.1	223.4	213.5
39	292.1	280.3	268.2	256.9	239.4	228.1	217.6	208.0
40	284.8	273.3	261.5	250.5	233.4	222.4	212.2	202.8
41	277.8	266.6	255.1	244.4	227.7	217.0	207.0	197.9
42	271.2	260.2	249.0	238.6	222.3	211.8	202.1	193.1
43	264.9	254.2	243.3	233.0	217.1	206.9	197.4	188.7
44	258.9	248.4	237.7	227.7	212.2	202.2	192.9	184.4
45	253.1	242.9	232.4	222.7	207.5	197.7	188.6	180.3
46	247.6	237.6	227.4	217.8	203.0	193.4	184.5	176.4
47	242.3	232.6	222.6	213.2	198.7	189.3	180.6	172.6
48	237.3	227.7	217.9	208.8	194.5	185.4	176.8	169.0
49	232.4	223.1	213.5	204.5	190.6	181.6	173.2	165.6
50	227.8	218.6	209.2	200.4	186.7	177.9	169.8	162.2
51	223.3	214.3	205.1	196.5	183.1	174.5	166.4	159.1
52	219.0	210.2	201.2	192.7	179.6	171.1	163.2	156.0
53	214.9	206.2	197.4	189.1	176.2	167.9	160.2	153.1
54	210.9	202.4	193.7	185.6	172.9	164.8	157.2	150.2

Safe loads given include weight of beam.

Greatest safe loads limited by web shear or buckling are given above the heavy line.

SAFE LOADS UNIFORMLY DISTRIBUTED FOR
BETHLEHEM I BEAMS,
IN THOUSANDS OF POUNDS.

Maximum Fiber Stress, 18,000 Pounds per Square Inch.

BEAMS SECURED AGAINST YIELDING SIDEWAYS.

Span in Feet.	B 36				B 33			
	36¼″ 173 Lbs.	36⅛″ 164 Lbs.	36″ 155 Lbs.	35⅞″ 147 Lbs.	33¼″ 152 Lbs.	33⅛″ 143 Lbs.	33″ 135 Lbs.	32⅞″ 125 Lbs.
					334.9	300.6		
18	.....	.....	.....	.....	318.9	299.6	267.4	
19	367.9	.....	.....	.....	302.2	283.8	266.7	
20	357.0	331.2	.....	.....	287.1	269.7	253.4	231.0
21	340.0	320.6	300 5	275.5	273.4	256.8	241.3	225.3
22	324.5	306.0	289.3	273.2	261.0	245.1	230.3	215.1
23	310.4	292.7	276.7	261.3	249.6	234.5	220.3	205.7
24	297.5	280.5	265.2	250.5	239.2	224.7	211.1	197.2
25	285.6	269.3	254.6	240.4	229.6	215.7	202.7	189.3
26	274.6	259.0	244.8	231.2	220.8	207.4	194.9	182.0
27	264.4	249.4	235.7	222.6	212.6	199.7	187.7	175.3
28	255.0	240.5	227.3	214.7	205.0	192.6	181.0	169.0
29	246.2	232.2	219.5	207.3	198.0	186.0	174.7	163.2
30	238.0	224.4	212.2	200.4	191.4	179.8	168.9	157.7
31	230.3	217.2	205.3	193.9	185.2	174.0	163.5	152.6
32	223.1	210.4	198.9	187.8	179.4	168.5	158.3	147.9
33	216.4	204.0	192.9	182.2	174.0	163.4	153.5	143.4
34	210.0	198.0	187.2	176.8	168.9	158.6	149.0	139.2
35	204.0	192.4	181.9	171.7	164.0	154.1	144.8	135.2
36	198.3	187.0	176.8	167.0	159.5	149.8	140.8	131.4
37	193.0	182.0	172.0	162.5	155.2	145.8	136.9	127.9
38	187.9	177.2	167.5	158.2	151.1	141.9	133.3	124.5
39	183.1	172.6	163.2	154.1	147.2	138.3	129.9	121.3
40	178.5	168.3	159.1	150.3	143.5	134.8	126.7	118.3
41	174.1	164.2	155.2	146.6	140.0	131.5	123.6	115.4
42	170.0	160.3	151.5	143.1	136.7	128.4	120.6	112.7
43	166.0	156.6	148.0	139.8	133.5	125.4	117.8	110.0
44	162.3	153.0	144.7	136.6	130.5	122.6	115.2	107.5
45	158.7	149.6	141.4	133.6	127.6	119.8	112.6	105.2
46	155.2	146.4	138.4	130.7	124.8	117.2	110.2	102.9
47	151.9	143.3	135.4	127.9	122.1	114.7	107.8	100.7
48	148.8	140.3	132.6	125.2	119.6	112.4	105.6	98.6
49	145.7	137.4	129.9	122.7	117.2	110.1	103.4	96.6
50	142.8	134.7	127.3	120.2	114.8	107.9	101.3	94.6
51	140.0	132.0	124.8	117.9	112.6	105.7	99.4	92.8
52	137.3	129.5	122.4	115.6	110.4	103.7	97.4	91.0

Safe loads given include weight of beam.

Greatest safe loads limited by web shear or buckling are given above the heavy line.

SAFE LOADS UNIFORMLY DISTRIBUTED FOR
BETHLEHEM GIRDER BEAMS,
IN THOUSANDS OF POUNDS.

Maximum Fiber Stress, 16,000 Pounds per Square Inch.

BEAMS SECURED AGAINST YIELDING SIDEWAYS.

Span in Feet.	G 36				G 33			
	36¼″ 260 Lbs.	36⅛″ 250 Lbs.	36″ 240 Lbs.	35⅞″ 231 Lbs.	33¼″ 230 Lbs.	33⅛″ 220 Lbs.	33″ 210 Lbs.	32⅞″ 202 Lbs.
					431.1	402.9		360.7
20	490.2	464.5	.....	.....	415.0	395.5	375.1	360.6
21	482.4	462.9	434.4	414.1	395.2	376.6	359.3	343.4
22	460.5	441.8	422.8	404.8	377.2	359.5	343.0	327.8
23	440.4	422.6	404.4	387.2	360.8	343.9	328.0	313.5
24	422.1	405.0	387.5	371.1	345.8	329.5	314.4	300.5
25	405.2	388.8	372.0	356.2	332.0	316.4	301.8	288.4
26	389.6	373.8	357.7	342.5	319.2	304.2	290.2	277.3
27	375.2	360.0	344.5	329.9	307.4	292.9	279.4	267.1
28	361.8	347.1	332.2	318.1	296.4	282.5	269.5	257.5
29	349.3	335.2	320.7	307.1	286.2	272.7	260.2	248.7
30	337.7	324.0	310.0	296.9	276.6	263.6	251.5	240.4
31	326.8	313.5	300.0	287.3	267.7	255.1	243.4	232.6
32	316.6	303.8	290.7	278.3	259.3	247.2	235.8	225.3
33	307.0	294.5	281.8	269.9	251.5	239.7	228.6	218.5
34	297.9	285.9	273.6	261.9	244.1	232.6	221.9	212.1
35	289.4	277.7	265.7	254.5	237.1	226.0	215.6	206.0
36	281.4	270.0	258.4	247.4	230.5	219.7	209.6	200.3
37	273.8	262.7	251.4	240.7	224.3	213.8	203.9	194.9
38	266.6	255.8	244.8	234.4	218.4	208.1	198.6	189.8
39	259.7	249.2	238.5	228.4	212.8	202.8	193.5	184.9
40	253.3	243.0	232.5	222.7	207.5	197.7	188.6	180.3
41	247.1	237.1	226.9	217.2	202.4	192.9	184.0	175.9
42	241.2	231.4	221.5	212.0	197.6	188.3	179.6	171.7
43	235.6	226.0	216.3	207.1	193.0	183.9	175.5	167.7
44	230.2	220.9	211.4	202.4	188.6	179.8	171.5	163.9
45	225.1	216.0	206.7	197.9	184.4	175.8	167.7	160.2
46	220.2	211.3	202.2	193.6	180.4	171.9	164.0	156.8
47	215.5	206.8	197.9	189.5	176.6	168.3	160.5	153.4
48	211.0	202.5	193.8	185.5	172.9	164.8	157.2	150.2
49	206.7	198.4	189.8	181.8	169.4	161.4	154.0	147.2
50	202.6	194.4	186.0	178.1	166.0	158.2	150.9	144.2
51	198.6	190.6	182.4	174.6	162.7	155.1	147.9	141.4
52	194.8	186.9	178.9	171.3	159.6	152.1	145.1	138.7
53	191.1	183.4	175.5	168.0	156.6	149.2	142.4	136.1
54	187.6	180.0	172.2	164.9	153.7	146.5	139.7	133.5

Safe loads given include weight of beam.
Greatest safe loads limited by web shear or buckling are given above the heavy line.

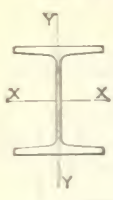
SAFE LOADS UNIFORMLY DISTRIBUTED FOR
BETHLEHEM I BEAMS,
IN THOUSANDS OF POUNDS.
Maximum Fiber Stress, 16,000 Pounds per Square Inch.

BEAMS SECURED AGAINST YIELDING SIDEWAYS.

Span in Feet.	B 36				B 33			
	36¼″	36⅛″	36″	35⅞″	33¼″	33⅛″	33″	32⅞″
	173 Lbs.	164 Lbs.	155 Lbs.	147 Lbs.	152 Lbs.	143 Lbs.	135 Lbs.	125 Lbs.
18	.....	.....	.....	.....	297.7 283.5	267.2 266.3	237.7	
19	327.0	.....	.....	.....	268.6	252.3	237.1	
20	317.4	294.4	.....	.....	255.2	239.7	225.2	205.3
21	302.2	285.0	267.1	244.9	243.0	228.3	214.5	200.3
22	288.5	272.0	257.2	242.9	232.0	217.9	204.7	191.2
23	276.0	260.2	246.0	232.3	221.9	208.4	195.8	182.9
24	264.5	249.4	235.8	222.6	212.6	199.8	187.7	175.3
25	253.9	239.4	226.3	213.7	204.1	191.8	180.2	168.2
26	244.1	230.2	217.6	205.5	196.3	184.4	173.2	161.8
27	235.1	221.7	209.6	197.9	189.0	177.6	166.8	155.8
28	226.7	213.8	202.1	190.8	182.3	171.2	160.9	150.2
29	218.9	206.4	195.1	184.2	176.0	165.3	155.3	145.0
30	211.6	199.5	188.6	178.1	170.1	159.8	150.1	140.2
31	204.7	193.1	182.5	172.4	164.6	154.6	145.3	135.7
32	198.3	187.0	176.8	167.0	159.5	149.8	140.8	131.4
33	192.3	181.4	171.5	161.9	154.6	145.3	136.5	127.5
34	186.7	176.0	166.4	157.1	150.1	141.0	132.5	123.7
35	181.3	171.0	161.7	152.7	145.8	137.0	128.7	120.2
36	176.3	166.3	157.2	148.4	141.8	133.2	125.1	116.8
37	171.5	161.8	152.9	144.4	137.9	129.6	121.7	113.7
38	167.0	157.5	148.9	140.6	134.3	126.2	118.5	110.7
39	162.7	153.5	145.1	137.0	130.8	122.9	115.5	107.8
40	158.7	149.6	141.5	133.6	127.6	119.9	112.6	105.2
41	154.8	146.0	138.0	130.3	124.5	116.9	109.9	102.6
42	151.1	142.5	134.7	127.2	121.5	114.1	107.2	100.1
43	147.6	139.2	131.6	124.3	118.7	111.5	104.7	97.8
44	144.3	136.0	128.6	121.4	116.0	109.0	102.4	95.6
45	141.0	133.0	125.7	118.7	113.4	106.5	100.1	93.5
46	138.0	130.1	123.0	116.2	110.9	104.2	97.9	91.4
47	135.0	127.3	120.4	113.7	108.6	102.0	95.8	89.5
48	132.2	124.7	117.9	111.3	106.3	99.9	93.8	87.6
49	129.5	122.1	115.5	109.0	104.1	97.8	91.9	85.8
50	126.9	119.7	113.2	106.9	102.1	95.9	90.1	84.1
51	124.5	117.4	110.9	104.8	100.1	94.0	88.3	82.5
52	122.1	115.1	108.8	102.7	98.1	92.2	86.6	80.9

Safe loads given include weight of beam.
Greatest safe loads limited by web shear or buckling are given above the heavy line.

SAFE LOADS, IN THOUSANDS OF POUNDS, FOR BETHLEHEM GIRDERS AND BEAMS USED AS COLUMNS.



Allowable Stress in Pounds per Square Inch:

$$\frac{15{,}000}{1+\frac{l^2}{18{,}000r^2}}$$

15,000 for lengths under 60 radii.

18,000 for lengths over 60 radii.

BETHLEHEM GIRDER BEAMS.

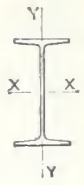
Section Number.	Nominal Depth of Beam, Inches.	Weight per Foot, Pounds.	Area, Square Inches.	Least Radius of Gyration, Inches.	UNSUPPORTED LENGTH OF COLUMN, IN FEET.					
					15	16	17	18	19	20
G36	36¼	260.0	76.50	3.57	1148	1148	1148	1144	1123	1101
	36⅛	250.0	73.61	3.54	1104	1104	1104	1098	1077	1055
	36	240.0	70.55	3.52	1058	1058	1058	1050	1030	1009
	35⅞	231.0	67.85	3.49	1018	1018	1018	1007	987	967
G33	33¼	230.0	67.85	3.43	1018	1018	1018	1001	981	960
	33⅛	220.0	64.80	3.41	972	972	972	954	934	915
	33	210.0	61.91	3.38	929	929	927	908	890	871
	32⅞	202.0	59.53	3.35	893	893	889	870	852	834

BETHLEHEM I BEAMS.

Section Number.	Nominal Depth of Beam, Inches.	Weight per Foot, Pounds.	Area, Square Inches.	Least Radius of Gyration, Inches.	UNSUPPORTED LENGTH OF COLUMN, IN FEET.					
					10	11	12	13	14	15
B36	36¼	173.0	50.94	2.43	764	764	764	746	725	703
	36⅛	164.0	48.10	2.41	722	722	722	702	682	661
	36	155.0	45.58	2.39	684	684	683	663	644	624
	35⅞	147.0	43.24	2.36	649	649	645	626	607	588
B33	33¼	152.0	44.69	2.28	670	670	658	638	618	598
	33⅛	143.0	42.05	2.26	631	631	618	598	579	560
	33	135.0	39.55	2.24	593	593	579	561	542	524
	32⅞	125.0	36.88	2.22	553	553	538	521	504	486

Beams not secured against yielding sideways and free to fail in the direction of the least Radius of Gyration.

SAFE LOADS, IN THOUSANDS OF POUNDS, FOR BETHLEHEM GIRDERS AND BEAMS USED AS COLUMNS.



Allowable Stress in Pounds per Square Inch:

$$\frac{15{,}000 \text{ for lengths under 60 radii.}}{1+\frac{l^2}{18{,}000r^2} \text{ for lengths over 60 radii.}}$$

BETHLEHEM GIRDER BEAMS.

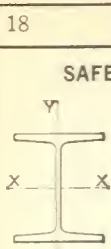
UNSUPPORTED LENGTH OF COLUMN, IN FEET.										BENDING FACTORS.		Section Number.
22	24	26	28	30	32	34	36	38	40	AXIS X-X. k	AXIS Y-Y. k′	
1056	1011	967	923	880	838	798	759	722	687	.081	.650	G36
1012	969	926	883	842	801	762	725	689	655	.081	.659	
968	926	884	843	803	764	727	691	657	625	.081	.666	
927	886	846	806	768	730	694	660	627	595	.081	.677	
919	878	837	797	758	720	684	649	616	585	.087	.671	G33
875	835	796	758	720	684	650	617	585	555	.087	.680	
832	794	756	719	684	649	616	584	554	526	.088	.688	
797	760	723	687	653	619	587	557	528	501	.088	.702	

BETHLEHEM I BEAMS.

UNSUPPORTED LENGTH OF COLUMN, IN FEET.										BENDING FACTORS.		Section Number.
16	17	18	19	20	22	24	26	28	30	AXIS X-X. k	AXIS Y-Y. k′	
681	659	637	616	595	554	515	479	445	413	.086	1.020	B36
640	619	599	578	558	519	483	448	416	387	.086	1.035	
604	584	564	545	526	489	454	421	391	.....	.086	1.052	
569	550	531	513	494	459	426	395	366	.....	.086	1.075	
577	557	537	517	498	461	426	394	365	.....	.093	1.085	B33
540	521	502	484	465	431	398	368	340	.....	.094	1.103	
506	487	469	452	435	402	371	343	316	.....	.094	1.120	
469	452	435	419	402	372	343	317	.....	.....	.094	1.134	

Loads to the right of the heavy line are for lengths greater than 120 radii.

SAFE LOADS, IN THOUSANDS OF POUNDS, FOR



BETHLEHEM GIRDERS AND BEAMS USED AS COLUMNS.

COMPUTED ACCORDING TO THE BUILDING LAWS OF NEW YORK AND CHICAGO.

Allowable Stress in Pounds per Square Inch:

$$16{,}000 - 70\frac{l}{r}.$$

14,000 maximum stress for Chicago.

BETHLEHEM GIRDER BEAMS.

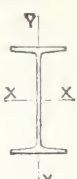
Section Number.	Nominal Depth of Beam, Inches.	Weight per Foot, Pounds.	Area, Square Inches.	Least Radius of Gyration, Inches.	Maximum Safe Load for Chicago.	UNSUPPORTED LENGTH OF COLUMN, IN FEET.				
						9	10	11	12	13
G36	36¼	260.0	76.50	3.57	1071	1062	1044	1026	1008	990
	36⅛	250.0	73.61	3.54	1031	1021	1003	986	968	951
	36	240.0	70.55	3.52	988	977	960	944	927	910
	35⅞	231.0	67.85	3.49	950	939	922	906	890	873
G33	33¼	230.0	67.85	3.43	950	936	919	903	886	870
	33⅛	220.0	64.80	3.41	907	893	877	861	845	829
	33	210.0	61.91	3.38	867	852	837	821	806	791
	32⅞	202.0	59.53	3.35	833	818	803	788	773	758

BETHLEHEM I BEAMS.

Section Number.	Nominal Depth of Beam, Inches.	Weight per Foot, Pounds.	Area, Square Inches.	Least Radius of Gyration, Inches.	Maximum Safe Load for Chicago.	UNSUPPORTED LENGTH OF COLUMN, IN FEET.				
						6	7	8	9	10
B36	36¼	173.0	50.94	2.43	713	709	692	674	657	639
	36⅛	164.0	48.10	2.41	673	669	652	635	619	602
	36	155.0	45.58	2.39	638	633	617	601	585	569
	35⅞	147.0	43.24	2.36	605	599	584	569	553	538
B33	33¼	152.0	44.69	2.28	626	616	600	583	567	550
	33⅛	143.0	42.05	2.26	589	579	563	548	532	517
	33	135.0	39.55	2.24	554	544	529	514	499	484
	32⅞	125.0	36.88	2.22	516	506	492	478	464	451

Beams not secured against yielding sideways and free to fail in the direction of the least Radius of Gyration

SAFE LOADS, IN THOUSANDS OF POUNDS, FOR BETHLEHEM GIRDERS AND BEAMS USED AS COLUMNS.



COMPUTED ACCORDING TO THE BUILDING LAWS OF NEW YORK AND CHICAGO.

Allowable Stress in Pounds per Square Inch:

$$16{,}000 - 70\,\frac{l}{r}.$$

14,000 maximum stress for Chicago.

BETHLEHEM GIRDER BEAMS.

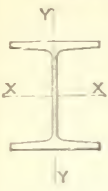
UNSUPPORTED LENGTH OF COLUMN, IN FEET.										BENDING FACTORS.		Section Number.
14	16	18	20	22	24	26	28	32	36	AXIS X-X. k	AXIS Y-Y. k′	
972	936	900	864	828	792	756	720	648	576	.081	.650	G36
933	898	863	828	793	759	724	689	619	549	.081	.659	
893	859	826	792	758	725	691	657	590	523	.081	.666	
857	824	792	759	726	694	661	628	563	498	.081	.677	
853	820	787	753	720	687	654	620	554	487	.087	.671	G33
813	781	749	718	686	654	622	590	526	462	.087	.680	
775	744	714	683	652	621	591	560	498	437	.088	.688	
744	714	684	654	624	594	564	535	475	415	.088	.702	

BETHLEHEM I BEAMS.

UNSUPPORTED LENGTH OF COLUMN, IN FEET.										BENDING FACTORS.		Section Number.
11	12	13	14	16	18	20	22	24	26	AXIS X-X. k	AXIS Y-Y. k′	
621	604	586	569	533	498	463	428	392	357	.086	1.020	B36
585	568	552	535	501	468	434	401	367	334	.086	1.035	
553	537	521	505	473	441	409	377	345	313	.086	1.052	
523	507	492	476	446	415	384	353	322	292	.086	1.075	
534	517	501	485	452	419	386	353	320	287	.093	1.085	B33
501	485	470	454	423	391	360	329	298	266	.094	1.103	
470	455	440	425	396	366	336	307	277	247	.094	1.120	
437	423	409	395	367	339	311	283	255	227	.094	1.134	

Loads to the right of the heavy line are for lengths greater than 120 radii but not exceeding 150 radii.

SAFE LOADS, IN THOUSANDS OF POUNDS, FOR BETHLEHEM GIRDERS AND BEAMS USED AS COLUMNS.



COMPUTED ACCORDING TO THE BUILDING LAWS OF THE CITY OF PHILADELPHIA.

Allowable Stress in Pounds per Square Inch:

$$\frac{16{,}250}{1+\frac{l^2}{11{,}000\,r^2}}$$

BETHLEHEM GIRDER BEAMS.

Section Number.	Nominal Depth of Beam, Inches.	Weight per Foot, Pounds.	Area, Square Inches.	Least Radius of Gyration, Inches.	UNSUPPORTED LENGTH OF COLUMN, IN FEET.					
					8	9	10	11	12	13
G36	36¼	260.0	76.50	3.57	1166	1148	1127	1106	1083	1059
	36⅛	250.0	73.61	3.54	1121	1103	1083	1062	1040	1017
	36	240.0	70.55	3.52	1074	1056	1037	1016	995	973
	35⅞	231.0	67.85	3.49	1032	1014	996	976	955	933
G33	33¼	230.0	67.85	3.43	1029	1011	992	972	950	928
	33⅛	220.0	64.80	3.41	982	965	946	927	906	885
	33	210.0	61.91	3.38	937	921	903	884	864	843
	32⅞	202.0	59.53	3.35	900	884	866	848	828	808

BETHLEHEM I BEAMS.

Section Number.	Nominal Depth of Beam, Inches.	Weight per Foot, Pounds.	Area, Square Inches.	Least Radius of Gyration, Inches.	UNSUPPORTED LENGTH OF COLUMN, IN FEET.					
					6	7	8	9	10	11
B36	36¼	173.0	50.94	2.43	767	747	725	702	678	653
	36⅛	164.0	48.10	2.41	723	704	683	661	638	614
	36	155.0	45.58	2.39	684	666	646	625	603	580
	35⅞	147.0	43.24	2.36	648	630	611	590	569	547
B33	33¼	152.0	44.69	2.28	666	646	625	603	580	557
	33⅛	143.0	42.05	2.26	626	607	587	566	544	522
	33	135.0	39.55	2.24	588	570	551	531	510	488
	32⅞	125.0	36.88	2.22	547	530	512	493	474	454

Beams not secured against yielding sideways and free to fail in the direction of the least Radius of Gyration.

SAFE LOADS, IN THOUSANDS OF POUNDS, FOR BETHLEHEM GIRDERS AND BEAMS USED AS COLUMNS.

COMPUTED ACCORDING TO THE BUILDING LAWS OF THE CITY OF PHILADELPHIA.

Allowable Stress in Pounds per Square Inch:

$$\frac{16{,}250}{1+\frac{l^2}{11{,}000\,r^2}}$$

BETHLEHEM GIRDER BEAMS.

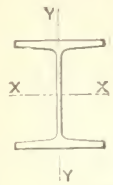
UNSUPPORTED LENGTH OF COLUMN, IN FEET.										BENDING FACTORS.		Section Number.
14	16	18	20	22	24	26	28	32	36	AXIS X-X. k	AXIS Y-Y. k′	
1035	984	933	881	830	781	734	689	606	533	.081	.650	G36
993	944	894	844	794	747	701	658	578	508	.081	.659	
950	902	854	806	759	713	669	627	551	484	.081	.666	
911	865	818	771	725	681	639	598	525	461	.081	.677	
905	858	810	763	717	672	629	589	515	451	.087	.671	G33
863	817	772	726	682	639	598	559	489	428	.087	.680	
822	778	734	690	647	606	567	530	463	405	.088	.688	
787	745	702	660	618	579	541	505	441	385	.088	.702	

BETHLEHEM I BEAMS.

UNSUPPORTED LENGTH OF COLUMN, IN FEET.										BENDING FACTORS.		Section Number.
12	13	14	15	16	18	20	22	24	26	AXIS X-X. k	AXIS Y-Y. k′	
627	602	577	552	528	482	439	399	364	331	.086	1.020	B36
590	566	542	519	496	452	411	374	340	310	.086	1.035	
557	534	511	489	467	425	386	351	319	291	.086	1.052	
525	503	481	460	439	399	362	329	299	271	.086	1.075	
533	509	486	464	442	400	362	327	296	269	.093	1.085	B33
499	477	455	433	413	373	337	305	276	250	.094	1.103	
467	446	425	405	385	348	314	284	257	233	.094	1.120	
433	414	394	375	357	322	291	262	237	.....	.094	1.134	

Loads given above are for lengths not exceeding 140 radii.

MAXIMUM SAFE SHEAR FOR BETHLEHEM GIRDERS AND BEAMS,



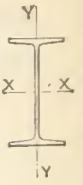
BASED UPON THE BUCKLING STRENGTH OF THE WEBS.

ALSO THE CORRESPONDING MINIMUM SPANS FOR GREATEST SAFE UNIFORMLY DISTRIBUTED LOADS

AND

MOMENTS OF RESISTANCE

ABOUT AXIS X-X.



BETHLEHEM GIRDER BEAMS.

Section Number.	Nominal Depth of Beam, Inches.	Weight per Foot, Pounds.	Maximum Safe Shear, Pounds.	Minimum Span, Feet.	MOMENTS OF RESISTANCE, IN FOOT POUNDS. For Fiber Stress of 18,000 Lbs. per Square Inch. R	For Fiber Stress of 16,000 Lbs. per Square Inch. R′	For Fiber Stress of 12,000 Lbs. per Square Inch. R″
G36	36¼	260.0	275,700	20.7	1,424,000	1,266,000	949,500
	36⅛	250.0	261,300	20.9	1,367,000	1,215,000	911,200
	36	240.0	244,300	21.4	1,308,000	1,163,000	872,000
	35⅞	231.0	232,900	21.5	1,252,000	1,113,000	835,000
G33	33¼	230.0	242,500	19.3	1,167,000	1,037,000	778,000
	33⅛	220.0	226,600	19.6	1,112,000	988,600	741,400
	33	210.0	211,000	20.1	1,061,000	943,100	707,300
	32⅞	202.0	202,900	20.0	1,014,000	901,400	676,000

BETHLEHEM I BEAMS.

Section Number.	Nominal Depth of Beam, Inches.	Weight per Foot, Pounds.	Maximum Safe Shear, Pounds.	Minimum Span, Feet.	MOMENTS OF RESISTANCE, IN FOOT POUNDS. For Fiber Stress of 18,000 Lbs. per Square Inch. R	For Fiber Stress of 16,000 Lbs. per Square Inch. R′	For Fiber Stress of 12,000 Lbs. per Square Inch. R″
B36	36¼	173.0	183,900	19.4	892,500	793,300	595,000
	36⅛	164.0	165,600	20.3	841,600	748,100	561,100
	36	155.0	150,300	21.2	795,600	707,200	530,400
	35⅞	147.0	137,700	21.8	751,400	667,900	500,900
B33	33¼	152.0	167,500	17.1	717,600	637,900	478,400
	33⅛	143.0	150,300	17.9	674,100	599,200	449,400
	33	135.0	133,700	18.9	633,400	563,000	422,300
	32⅞	125.0	115,500	20.5	591,500	525,800	394,300

BETHLEHEM STEEL COMPANY

General Offices

BETHLEHEM, PENNSYLVANIA

District Offices

Atlanta	Healey Building
Boston	Atlantic National Bank Building
Baltimore	Continental Building
Buffalo	Marine Trust Building
Chicago	People's Gas Building
Cincinnati	Union Trust Building
Cleveland	Union Trust Building
Detroit	Penobscot Building
Houston	Post Dispatch Building
Los Angeles	Pacific Finance Building
New York	Cunard Building
Philadelphia	Widener Building
Pittsburgh	Oliver Building
Portland	American Bank Building
St. Louis	Arcade Building
San Francisco	Matson Building
Seattle	L. C. Smith Building

Bethlehem Steel Export Corporation
25 Broadway, New York City

Sole Exporter of Our Commercial Products

Printed in the U. S. A.

BETHLEHEM STEEL COMPANY.

BETHLEHEM, PA.

PARTIAL LIST OF PRODUCTS.

STRUCTURAL STEEL SHAPES: Bethlehem Beams, Rolled Girder Beams, Rolled Columns, Joists and Stanchions; Standard Beams, Channels and Angles; Standard and Special T and Z Bars; Plain and Fabricated; Crane Rails; Rolled Steel Slabs for Column Bases.

SHIPBUILDING SHAPES: Ship Channels, Bulb Angles, and Hatch Sections.

CAR BUILDING SHAPES: Beams, Channels, Angles, Bulb Angles, Z Bars, Center and Side Sill Sections, Belt Rail, Door Spreader, and Side Stake Sections.

PLATES: Universal and Sheared; Circular (Heads), in all grades for all purposes; Miscellaneous Pressed Work.

PILING: Lackawanna Steel Sheet Piling.

BRIDGES AND FABRICATED BUILDINGS: Designers, Builders, Fabricators and Erectors of all types of Bridges and Steel Structures. Buckle Plates.

RAILROAD TURNTABLES: Bethlehem Twin-Span Turntables; Balanced and Continuous Turntables.

FLANGED AND DISHED BOILER HEADS, SPECIAL FLANGED PRODUCTS.

AGRICULTURAL STEEL AND SPECIALTIES: Standard and Special Shapes.

AUXILIARY LOCOMOTIVES.

BARS AND BANDS: Muck Bar, Refined, Double Refined Iron; Bessemer, Open Hearth, Electric Alloy Steel; Concrete Reinforcing Bars; Sheet Bars.

BILLETS, BLOOMS, SLABS AND SKELP.

BOILER TUBES: Lap Welded; Charcoal Iron, and Steel.

BOLTS, NUTS, RIVETS, SPIKES, POLE LINE MATERIAL.

CASTINGS: Steel, Iron, Brass and Bronze; Centrifugal Castings.

ENGINES: Blowing, Producer Gas, Gas, and Diesel Oil Engines.

FERRO-MANGANESE, SPIEGELEISEN, COKE AND COKE BY-PRODUCTS.

FORGINGS: Drop, Hammered and Hydraulically Pressed; All sizes and types; Forged Shafts.

FREIGHT CARS, STEEL AND COMPOSITE, ROLLED STEEL CAR WHEELS.

GAS AND STEAMING COAL.

GEARS AND PINIONS: Cut and Cast; Bridge Operating Machinery.

INDUSTRIAL AND MINE TRACK WORK, STEEL MINE TIES.

INGOT MOULDS: All sizes.

MACHINERY: Hydraulic Machinery and equipment; Special Machinery of all types and designs.

MOTOR TRUCK WHEELS, ROLLED STEEL.

PIG IRON: Standard Grades, Special Grades and Mayari.

PIPE AND TUBULAR GOODS: Lap-welded, Butt-welded, Pipe, Casing and Tubing for all Purposes.

PULVERIZERS FOR COAL AND OTHER MATERIALS.

RAILS AND ACCESSORIES, FROGS AND SWITCHES.

ROLLED STEEL BLANKS FOR GEARS, PINIONS, FLY WHEELS, ETC.

ROLLS: Carbon and Alloy Steel.

SHEET AND TIN MILL PRODUCTS: ROLL ROOFING.

SPECIAL STEEL FOR AUTOMOBILE FORGINGS AND MACHINED PARTS.

STEEL AXLES: For Passenger and Freight Cars, Engine and Tender Trucks; Driving; Motor; Electric and Mine Car; etc.

TOOL STEEL FOR EVERY PURPOSE: Bethlehem Special High-Speed Tool Steel; Non-shrinkable; Rock and Mine Drill Steel; Special Tool Steel; Small Tools, etc.

WIRE RODS, WIRE NAILS, WIRE, Woven Field and Poultry Fencing.

PLANTS AT

Bethlehem, Pa.; Lebanon, Pa.; Coatesville, Pa.; Johnstown, Pa.; Steelton, Pa.; Lackawanna, N. Y.; Sparrows Point, Md.; Wilmington, Del., Elizabeth, N. J.